

WHAT IS CLAIMED IS:

1. A magnetic sensor comprising:

a substrate which has at least one insulating main surface;

at least two serially connected magnetoresistive devices, formed on the insulating main surface, each of which includes at least one magnetic tunnel junction device;

an organic film, which is for relieving thermal stress and formed to cover one of the magnetoresistive devices through an insulating film for passivation; and

a magnetic shield layer, which is formed to cover one magnetoresistive device through the organic film and the insulating film.

2. The magnetic sensor according to Claim 1, further comprising:

another organic film formed on the organic film to cover the magnetic shield layer.

3. A magnetic sensor comprising:

a substrate which has at least one insulating main surface;

at least two serially connected magnetoresistive devices, formed on the insulating main surface, each of which includes at least one magnetic tunnel junction device; and

a magnetic shield layer, which is formed to cover one of the two magnetoresistive devices through an insulating film

for passivation and made of a nickel-iron alloy having a nickel content of 69% or less.

4. The magnetic sensor according to Claim 3, wherein the magnetic shield layer is formed on the insulating film through an organic film for relieving thermal stress.

5. The magnetic sensor according to Claim 1 to 4, wherein the magnetic shield layer has no undercut along the bottom of each of its side walls.

6. A magnetic sensor manufacturing method comprising steps of:

preparing a substrate which has at least one insulating main surface;

forming at least two serially connected magnetoresistive devices on the insulating main surface, each of the magnetoresistive devices including at least one magnetic tunnel junction device;

forming an insulating film for passivation to cover the two magnetoresistive devices;

forming an organic film for relieving thermal stress to cover one of the magnetoresistive devices through the insulating film;

forming a magnetic shield layer to cover one magnetoresistive device through the organic film and the insulating film; and

5 bonding the other main surface of the substrate to a supporting material through a heat bonding layer by heat treatment with the two magnetoresistive devices, the insulating film, the organic film, and the magnetic shield layer formed on the insulating main surface of the substrate.

7. A magnetic sensor manufacturing method comprising the steps of:

10 preparing a substrate which has at least one insulating main surface;

forming at least two serially connected magnetoresistive devices on the insulating main surface, each of the magnetoresistive devices including at least one magnetic tunnel junction device;

15 forming an insulating film for passivation to cover the two magnetoresistive devices;

forming an organic film for relieving thermal stress to cover the two magnetoresistive devices through the insulating film;

20 forming three connecting holes in the organic film, where the three holes correspond to a first and a second bonding pad at one and the other end of the serial path of the two magnetoresistive devices and a third bonding pad at the section of interconnection of the two magnetoresistive devices, respectively;

25 setting the organic film by heat treatment after forming the three connecting holes;

forming a magnetic shield layer to cover one of the two magnetoresistive devices through the organic film set by the heat treatment process;

5 forming three connecting holes by a selective removal process using the organic film as a mask, after formation of the magnetic shield layer, where the three holes correspond to the first to third bonding pads, respectively and are continuous with the three connecting holes formed in the organic film; and

10 bonding the other main surface of the substrate to a supporting material through a heat bonding layer by heat treatment with the two magnetoresistive devices, the insulating film, the organic film, and the magnetic shield layer formed on the insulating main surface of the substrate.

15 8. The magnetic sensor manufacturing method according to Claim 7, wherein a polyimide film, a resist film, or a benzocyclobutene film is formed as the organic film at step of forming the organic film, and the polyimide, resist or benzocyclobutene film is set by heat treatment at a temperature
20 of less than 300°C at step of setting the organic film.